Resources

Here are some excellent online and print resources about home heating and heat pumps:

ONLINE (each site has it's own section on heat pumps)

US Department of Energy's Consumer Guide to Energy Efficiency and Renewable Energy
http://www.eere.energy.gov/consumer/

American Council for an Energy-Efficient Economy
http://www.aceee.org/consumerguide

US Environmental Protection Agency's Energy Star Program
http://www.energystar.gov/

PRINT

Residential Energy – Cost Savings and Comfort for Existing Buildings – 4th Edition
By John Krigger and Chris Dorsi
Published by Saturn Resource Management, Inc

Consumer Guide to Home Energy Savings – 8th Edition
By Alex Wilson, Jennifer Thorne, and John Morrill
Published by the American Council for an Energy-Efficient Economy

NOTE: This book is available for free by calling Seattle City Light's Conservation Help Line.

Seattle City Light
700 5th Avenue, Suite 3300
P. O. Box 34023
Seattle, WA 98124-4023
Conservation Help Line: (206) 684-3800
www.seattle.gov/light/conserve

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Purchasing a Heat Pump

Seattle City Light

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Introduction

What is a heat pump?

Heat naturally travels from a warm area to a cool area. A heat pump makes heat travel in the opposite direction from cool to warm (or warm to cool). It uses energy to pump heat "uphill". If you own a refrigerator, you own a heat pump of sorts; the cooling elements of a refrigerator pump heat from inside the box to outside. However, for the purpose of this brochure we will use the term "heat pump" to mean a device that heats a home.
[NOTE: The two main sources of heat for heat pumps are air and ground. Because ground-source types are prohibitively expensive compared to the benefit they provide a typical Seattle area residence, this brochure will only discuss air-source types.]

How does a heat pump work?

While not covered in this brochure, on the back page we list some excellent online and print resources that explain clearly and in detail, how heat pumps work.

Should I install a heat pump?

A heat pump will give you about twice as much heat as an electric resistance furnace for the same amount of energy consumed. In other words, if your electric furnace uses 9,000 kWh of electricity per year to heat your home (about average for a Seattle house), a heat pump would use only one-half the energy (about 4,500 kWh) or less to provide the same amount of heat – a savings of $375 a year.

Although it has many advantages, a heat pump won't serve the needs of every household. We hope that this booklet will help you understand the technology, so you can decide for yourself whether or not installing a heat pump makes sense for you and your family.

Heat Pump Pros and Cons

PROS

1. **A heat pump can save on operating costs.** An average single-family house in Seattle uses about 9,000 kWh per year for heating. That costs about $770[1]. A heat pump that meets the Federal Energy Efficiency standard[2] will use 4,500 kWh to do the same job, so you'll save $375 a year in electricity costs. (Consult Appendix A for help in estimating how much of your light bill goes to heating.)
2. **You can use a heat pump to cool your home during hot weather.** If you have already have a central air conditioning system, a heat pump makes sense because it replaces both the furnace and the central air-conditioning unit.
3. **Heat pump systems move a larger volume of air than furnace systems.** This means that you will enjoy a more even temperature throughout your house, and any air cleaning system that's part of your heating system will do more to scrub the air.

[1] Based on Seattle City Light's second tier residential rate of $.0839/kWh.

[2] Heating Season Performance Factor (HSPF) 7.7

CONS

1. **A heat pump cost more to buy than a furnace.** Expect to pay at least $1000 more for a heat pump than for a furnace with an equal heating capacity. In addition, if you're replacing a furnace with a heat pump, you most likely will have to enlarge the ducts to allow for the larger volume of airflow. Your operating cost savings will probably let you recover these additional costs within a few years, but you will need to have the money up front.
2. **A heat pump needs a back-up heating system.** As temperatures approach freezing (32°F), heat pumps no longer can extract as much heat from the air, and they must switch to a back-up electric resistance heat system. Fortunately in Seattle, we rarely have more than a few weeks of really cold weather. But heat pumps are always installed as a 2-part system that includes the compressor unit to move heat from the outdoors, and a regular electric resistance furnace.
3. **A heat pump provides less intense heat than a furnace.** With a heat pump, your days of standing in front of the heat vent to get warm are over because the air that comes out feels cool.
4. **Heat pumps require larger ducts.** Because air warmed by a heat pump is not as warm as a regular furnace, ducts and registers need to be larger and the airflow rate faster to carry the same amount of heat.

5. **A heat pump is more complicated than an electric furnace.** That means you need regular maintenance checks to minimize the chance of a breakdown that requires an expensive repair.
6. **A heat pump makes noise.** Most heat pumps installed in homes are of the split system variety, so the noisy part is located outside the house. However, the amount of noise may trouble someone whose room is near the compressor unit, or it may disturb your neighbor.
7. **A heat pump has no clear price advantage over a gas furnace.** At current energy prices, a heat pump offers very little significant operating cost financial advantage over a natural gas furnace. It also provides no net reduction in greenhouse gas emissions compared with a gas furnace. Consult the table in Appendix B for space heat cost comparisons.

Efficiency Ratings

It's easy to get confused about the meanings of all the efficiency ratings for a heat pump. There's SEER and EER and HSPF and COP. All of these acronyms mean something, but not all of the meaning have importance for those of us who live in the Puget Sound area.

Since we in the Northwest have a heating season that can often last for 10 months of the year, the heating efficiency of a heat pump has greater importance than the cooling efficiency. Heating efficiency is described by the HSPF, the Heating Season Performance Factor, and the Federal efficiency minimum is currently HSPF 7.7. For most locales in the U.S., the cooling efficiency of a heat pump has a much greater importance than here, and unfortunately, most heating contractors get trained for a national audience rather than a local one. So don't be surprised if the contractor looks oddly at you when you ask about the HSPF. They're usually trained to speak of efficiency in terms of SEER, the Seasonal Energy Efficiency Rating, which measures the cooling efficiency.

City Light recommends choosing a heat pump that meets the Energy Star standard of HSPF 8.0. Choosing an even higher HSPF may or may not make sense for you. Greater efficiency often comes at greater cost. The added electricity savings may or may not justify this added cost. Consult Appendix B for space heat cost comparisons.

Choosing a Contractor

If you've decided that a heat pump is for you, you will need to find a contractor to make the installation. This is never a simple task, and City Light may not make recommendations. Take your time, ask questions, check references, get multiple bids, and be as well informed as possible. In this section we offer a few helpful tips.

Use the following questions to help evaluate contractors who are bidding to install your heat pump.

And remember that the lowest bid will not necessarily be the one you should accept.

1. Did the contractor do a room-by-room heat loss calculation and show you the results before making their proposal? (A heat loss calculation involves checking insulation levels and measuring window areas which is essential to a properly sized heat pump.)
2. Did the contractor thoroughly examine your existing ductwork and describe any changes that needed to be made? (A properly designed heat pump system requires precisely designed ductwork.)
3. Will the contractor install balancing dampers in each room to control airflow and eliminate hot spots?
4. Does the contractor's bid show the following:
   a) Size, manufacturer, model and efficiency (in HSPF) of heat pump
   b) Length and cost of warranty
   c) What the warranty covers (labor, materials, etc.)
   d) Cost of additional electric service, if needed
   e) Cost of duct installation and/or existing duct modifications
   f) Cost of duct insulation and sealing
   g) Cost of automatic set-back thermostat that includes back-up heat indicator lights (recommended)
   h) Electronic or ultraviolet air filter
   i) Location where equipment will be installed
   j) Cost to pour concrete slab, if needed
5. Will the contractor provide the following:
   a) Required permits

   b) Owner's manual and clear instructions for homeowner maintenance, especially filter replacement and cleaning
   c) 24-hour emergency service

Appendix A – How to Calculate Your Electric Heat Consumption*

You will need a record of your metered electricity consumption (kWh) for the past year and a calculator. You can get your consumption history online from the Seattle City Light Home Resource Profile Service at **www.seattle.gov/conserve/homeprofile/** You'll need to provide your SCL account number and zip code to gain access to the information. Or you can call the Conservation Help Line at **206-684-3800**.

With your calculator, do the following steps:

1. Add up your kWh usage for the whole year and record the total. (This is how much electricity you used for everything in your house for a full year.)
2. Find the 2-month period of lowest consumption and record the kWh consumed. This almost always occurs during the summer months, and we will assume that you use no electricity for heat during that period.

* Assumes you have an existing electric furnace or electric baseboards/wall fans.

3. Multiply the lowest consumption by 6 (or by 12 if you get billed monthly), and record that number. For simplicity sake, we are assuming that this non-heat consumption is the same year-round.
4. Subtract that number from your yearly kWh total. This number represents an estimate of how much electricity you use to heat your home.
5. Multiply this number by $.0839 (what SCL charges per kWh) to calculate how much your electric heats currently costs you.

Appendix B – Space Heat Cost Comparisons

Annual Fuel Cost Comparisons

For 9,000 kWh (or equivalent) per year in delivered heat

Prices effective as of 11/05.

Heating Systems and their Efficiency Ratings		Costs (*converted to therms*)	
		Per therm	Per year
Oil Furnace $2.85 per gallon	60% AFUE	$3.39	$1,389
	80% AFUE	$2.54	$1,041
Gas Furnace $1.13 per therm*	60% AFUE	$1.88	$ 771
	80% AFUE	$1.41	$ 578
	90% AFUE	$1.26	$ 514
	95% AFUE	$1.19	$ 487
Electric Furnace $0.0839 per kWh	100% AFUE	$2.46	$1,006
Heat Pump does not include costs of back-up heat**	8.0 HSPF	$1.05	$ 428
	8.5 HSPF	$0.98	$ 402

* A therm is a unit of heat-energy for natural gas.

** With temperatures in Seattle rarely falling below freezing, back-up heating costs account for only a small fraction (5-10%) of total yearly heating costs.

TERMS USED TO DESCRIBE HEAT PUMP EFFICIENCIES

AFUE – Annual Fuel Utilization Efficiency: how much usable heat is delivered from the system. [NOTE: AFUE does not reflect distribution losses such as what is lost when heat has to travel through ducts or pipes before it enter a living space.] Gas and oil systems are not 100% efficient because some of the heat goes up the chimney along with fumes, smoke and particulates.

HSPF – Heating Season Performance Factor: used to rate the heating efficiency of heat pumps. It is the ratio of the estimated seasonal heating output in BTU's divided by the seasonal power input in watt-hours. To qualify for an Energy Star rating, air-source heat pumps must have an HSPF of 8.0 or higher.

COP – Coefficient of Performance: The ratio of delivered energy (how much heat is delivered by your heat pump) to consumed energy (how much energy it took to produce that heat), with typical values ranging from 1.5 to 3.5 (the higher, the better). Also based on air temperature. As the air gets colder, the COP gets worse. At 30° F, most air-source heat pumps are no more efficient than an electric furnace.

SEER – Seasonal Energy Efficiency Ratio: measures how efficiently a residential central cooling system (air conditioner or heat pump) will operate over an entire cooling season, as opposed to a single outdoor temperature. Not an appropriate guide for rating heat pumps used in the Northwest.